

## CLAIMS

1. A recording medium having recorded thereon a video stream and a graphics stream, wherein:

5       the video stream represents a moving picture made up of a plurality of pictures;

          the graphic stream is used for overlaying a multi-page menu on the moving picture, and includes interactive control information and graphics data;

10       the graphics data is used for generating the multi-page menu; and

          the interactive control information includes time information used for controlling behavior of the multi-page menu in accordance with a playback proceeding of the video stream.

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2. The recording medium according to Claim 1, wherein:

          the multi-page menu includes a main page and a sub page;

          the multi-page menu behavior includes presentation of the main page in accordance with the playback proceeding of the video  
20       stream; and

          the time information includes timing information showing a time for presentation of the main page.

3. The recording medium according to Claim 2, wherein:

25       the multi-page menu behavior includes presentation of the sub page in accordance with the playback proceeding of the video stream;

the main page includes a button material for receiving a user operation instructing a playback apparatus to present the sub page; and

the time information includes first timeout information showing a time for automatically activating the button material.

4. The recording medium according to Claim 3, wherein:

the interactive control information includes a navigation command for the playback apparatus to execute upon activation of the button material on the main page; and

the navigation command includes a specification of a page of the multi-page menu to be presented and a specification of a button material to be presented in a selected state on the specified page.

5. The recording medium according to Claim 3, wherein:

the multi-page menu behavior includes removal of the on-screen sub page in accordance with the playback proceeding of the video stream; and

the time information includes second timeout information showing a time for automatically removing the on-screen sub page.

6. The recording medium according to Claim 2, wherein:

the interactive control information is encapsulated in a packet;

the time information is a presentation time stamp attached to the packet; and

a decoding time stamp attached to the packet shows a time for a playback apparatus to start decoding the interactive control information.

5 7. The recording medium according to Claim 6, wherein:

a value of the presentation time stamp is calculated by adding a sum of a first duration value and a second duration value to a value of the decoding time stamp;

10 the first duration is a longer one of a duration taken to decode the graphics data included in the graphics stream and a duration taken to clear a graphics plane; and

the second duration is a duration taken to transfer a complete set of uncompressed graphics used for presentation of the main page.

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8. The recording medium according to Claim 7, wherein:

the main page includes a plurality of button materials;

20 a specific one of the button materials is presented in a selected state and the other button materials are presented in a normal state;

the set of uncompressed graphics used for presentation of the main page includes

25 uncompressed graphics obtained by decoding graphics data associated with the selected state of the specific button, and

uncompressed graphics obtained by decoding graphics data associated with the normal state of each of the other buttons;

and

the transfer duration is a value calculated by dividing a total size of the set of uncompressed graphics by a transfer rate of the playback apparatus.

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9. The recording medium according to Claim 7, wherein:

the transfer duration is calculated by dividing a size T of the set of uncompressed graphics by a transfer rate of the playback apparatus; and

10 the size T is calculated by a size TA + a size B - a size NB, where

the size TA is a total size of graphics data associated with the normal state of each button included in the main page,

the size B is a size of a button LRG,

15 the size NB is a size of uncompressed graphics associated with the normal state of the button LRG, and

the button LRG is a button material of which uncompressed graphics is largest in data size, out of all of the button materials included in the main page.

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10. The recording medium according to Claim 1, wherein:

the interactive control information includes stream model information;

the stream model information shows whether

25 the graphics stream recorded on the recording medium is multiplexed with the video stream and to be supplied to a playback apparatus, or

the graphics stream recoded on the recording medium is non-multiplexed with the video stream and to be preloaded to a memory of the playback apparatus; and

the time information is valid only when the stream model information shows that the graphics stream is multiplexed with the video stream.

11. The recording medium according to Claim 1, wherein:

the multi-page menu includes a main page and a sub page;

10 the behavior of the multi-page menu includes pop-up on presentation of the main page in accordance with the playback proceeding of the video stream; and

the time information includes timing information showing a time at which the main page becomes available for the pop-up on presentation.

12. The recording medium according to Claim 11, wherein:

the multi-page menu behavior includes removable of on-screen pages presented by way of the pop-up on presentation; and

the time information includes timeout information showing a time for automatically removing all on-screen pages of the multi-page menu.

25 13. A playback apparatus used for playing back a video stream and a graphics stream, comprising:

a video decoder operable to decode the video stream to obtain

a moving picture; and

a graphics decoder operable to decode the graphics stream so as to overlaying a multi-page menu on the moving picture, wherein:

5       the graphics stream includes interactive control information and graphics data used to generate pages of the multi-page menu; and

the graphics decoder includes

10       a composition buffer operable to store the interactive control information, and

a controller operable to control behavior of the multi-page menu in accordance with a playback proceeding of the video stream.

15   14. The playback apparatus according to Claim 13, wherein:

the multi-page menu includes a main page and a sub page; and

20       the controller controls the behavior of the multi-page menu so as to present the main page when playback of the video stream reaches a point corresponding to a time shown by a time stamp attached to a packet containing the interactive control information.

15. The playback apparatus according to Claim 14, wherein:

25       the main page includes a button material for receiving a user operation instructing to present the sub page;

the playback apparatus further comprises a selection timer,

the selection timer being operable to be set to a value of a timeout shown by the time information upon presentation of the main page and to continuously count down while no user operation is received; and

5       the controller controls the multi-page menu behavior to present the sub page by automatically activating the button material upon a timeout of the selection timer.

16. The playback apparatus according to Claim 15, wherein:

10       the interactive control information includes a navigation command to be executed by the playback apparatus upon activation of a button material on the main page; and

          when a button material is activated, the controller decodes a navigation command associated with the activated button material to present a page specified by the navigation command  
15       and to put a button material specified by the navigation command to a selected state.

17. The playback apparatus according to Claim 15, further  
20       comprising a user timeout timer, the user timeout timer being operable to be set to a value of a timeout shown by the time information upon presentation of the main page and to continuously count down while no user operation is received,

          wherein the controller automatically removes the on-screen  
25       sub page upon a timeout of the user timeout timer.

18. The playback apparatus according to Claim 14, wherein:

the time stamp is a presentation time stamp attached to the packet; and

the controller starts decoding the interactive control information at a time shown by a decoding time stamp attached  
5 to the packet.

19. The playback apparatus according to Claim 18, further comprising a graphics plane operable to store graphics to be overlaid on the moving picture, wherein:

10 the graphics decoder includes

a processor operable to decode the graphics data included in the graphics stream, and

an object buffer operable to store uncompressed graphics obtained by the processor;

15 a value of the presentation time stamp is calculated by adding a sum of a first duration value and a second duration value to a value of the decoding time stamp;

the first duration is a longer one of a duration taken for the graphics decoder to decode the graphics data included in the graphics stream and a duration taken for the graphics decoder  
20 to clear the graphics plane; and

the second duration is a time taken for the object buffer to transfer and render, to the graphics plane, a complete set of uncompressed graphics necessary for presentation of the main  
25 page.

20. The playback apparatus according to Claim 19, wherein:

the main page includes a plurality of button materials;  
a specific one of the button materials is presented in a  
selected state and the other button materials are presented in  
a normal state;

5 the set of uncompressed graphics used for presentation of  
the main page includes

uncompressed graphics obtained by decoding graphics  
data associated with the selected state of the specific button,  
and

10 uncompressed graphics obtained by decoding graphics  
data associated with the normal state of each of the other buttons;  
and

the transfer duration is a value calculated by dividing  
a total size of the set of uncompressed graphics by a transfer  
15 rate at which uncompressed graphics are transferred from the  
object buffer to the graphics plane.

21. The playback apparatus according to Claim 19, wherein:

the transfer duration is calculated by dividing a size T  
20 of the set of uncompressed graphics by a transfer rate at which  
uncompressed graphics are transferred from the object buffer  
to the graphics plane; and

the size T is calculated by a size TA + a size B - a size  
NB, where

25 the size TA is a total size of graphics data associated  
with the normal state of each button included in the main page,

the size B is a size of a button LRG,

the size NB is a size of uncompressed graphics associated with the normal state of the button LRG, and

the button LRG is a button material of which uncompressed graphics is largest in data size, out of all of the button materials included in the main page.

22. The playback apparatus according to Claim 13, wherein:

the interactive control information stored in the composition buffer includes stream model information;

when the stream model information shows that the graphics stream is multiplexed with the video stream, the controller discards the interactive control information in the composition buffer in accordance with a current playback point of the video stream; and

when the stream model information shows that the graphics stream is preloaded to the composition buffer, the controller retains the interactive control information regardless of the current playback point.

23. The playback apparatus according to Claim 13, further comprising a graphics plane for storing pages of the multi-page menu one by one, wherein:

the graphics decoder assembles a page on the graphics plane by decoding the graphics data included in the graphics stream and rendering uncompressed graphics obtained by the decoding to the graphics plane; and

the controller turns on contents stored on the graphics

plane if a user operation for pop-up on is made after a current playback point reaches a predetermined point, so that the page is overlaid on the moving picture, and turns off the contents stored on the graphics plane if a user operation for pop-up off is made, so that the on-screen page is removed.

24. The playback apparatus according to Claim 23, wherein the predetermined point is shown by a time stamp attached to a packet containing the interactive control information.

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25. The playback apparatus according to Claim 24, further comprising a user timeout timer, the user timeout timer being operable to be set to a value of a timeout shown by the time information upon presentation of the main page and to continuously count down while no user operation is received, wherein

the controller automatically turns off the contents stored on the graphics plane to automatically remove all on-screen pages.

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26. A method for recording onto a recording medium, comprising: generating application data; and recording the application data onto the recording medium, wherein:

25 the application data includes a video stream and a graphics stream;

the video stream represents a moving picture made up of

a plurality of pictures;

the graphic stream is used for overlaying a multi-page menu on the moving picture, and includes interactive control information and graphics data;

5 the graphics data is used for generating the multi-page menu; and

the interactive control information includes time information used for controlling behavior of the multi-page menu in accordance with a playback proceeding of the video stream.

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27. A program used for enabling a computer to play back a video stream and a graphics stream, comprising:

code operable to cause the computer to decode the video stream to obtain a moving picture; and

15 code operable to cause the computer to decode the graphics stream so as to overlay a multi-page menu on the moving picture, wherein:

the graphics stream includes interactive control information and graphics data used to generate pages of the

20 multi-page menu; and

the code operable to cause the computer to decode the video stream includes code operable to cause the computer to control behavior of the multi-page menu based on the interactive control information.

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28. A method for playing back a video stream and graphics stream, comprising:

decoding the video stream to obtain a moving picture; and  
decoding the graphics stream so as to overlay a multi-page  
menu on the moving picture, wherein:

the graphics stream includes interactive control  
5 information and graphics data used to generate pages of the  
multi-page menu; and

the decoding of the graphics stream includes controlling  
behavior of the multi-page menu based on the interactive control  
information.

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